ABSTRACT

The present invention relates to an impact ionisation avalanche transit time (IMPATT) diode device comprising an avalanche region and a drift region, wherein at least one narrow bandgap region, with a bandgap narrower than the bandgap in the avalanche region, is located adjacent to or within the avalanche region in order to generate within the narrow bandgap region a tunnel current which is injected into the avalanche region. This improves the predictability with which a current can be injected into the avalanche region and enables a relatively narrow pulse of current to be injected into the avalanche region in order to enable a relatively noise free avalanche multiplication. The narrow bandgap region may be located between a heavily doped contact region and the avalanche region and is preferably arranged to generate a tunnel current at the peak reverse bias applied to the diode.